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SOME NOTES ON THE GENUS LEUCADENDRON.  
WITH DESCRIPTIONS OF NEW SPECIES.

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In undertaking, in connection with the projected Flora of the Cape Peninsula, a rather more critical examination than has previously been made of some of the species of *Leucadendron*, it has been found that at least two of them have hitherto been misidentified and are, in fact, unnamed species. These are here described as *L. saxatile* and *L. sabulosum*, with some notes as regards their previous misidentification. *L. riparium*, sp. nov., falls into a rather different category, for it may possibly be a form of *L. glabrum* R. Br., but my reasons for describing it, together with its two varieties *collinum* and *Pillansii*, are given later in the notes under the species in question. *L. Guthrieae*, sp. nov., is only known in Caledon and Bredasdorp Divisions, but since it has previously been confused with *L. saxatile* and *L. decorum* R. Br., I take the opportunity of describing it at the same time. The descriptions and figures have all been compiled from living specimens.\*

Our systematic knowledge of this large characteristic South African genus is surprisingly scant, and all herbarium workers experience great difficulty in associating their specimens with the descriptions to be found in botanical literature, many of which are incomplete and in some cases apply to one sex only. The short 3—4-line descriptions of Knight and R. Brown, the early so-called authorities on the Proteaceae, are hopelessly inadequate unless reference can be made to the *types* which they

\* I have found that flowering heads preserved in alcohol have been of the utmost value for re-checking the floral characters; indeed I believe that the ideal herbarium collection in this genus ought to be supplemented by specimens so preserved. In this state, too, the inflorescences are far more easy to dissect than either in the living or "soaked out" state.

cite (*i.e.* if they are still in existence and are recognisable), nor can much more be said for those of Meisner in D. C. Prod. XIV., for they seem to concentrate on what we now know to be the characters of the least taxonomic importance. These workers were right, however, in attempting to group the species by the nature of the fruits, but in several cases they appear to have only guessed at this character and guessed wrongly.

The unsatisfactory classification, by the pubescence or otherwise of the leaves, as used in the Flora Capensis, was evidently adopted because the fruits of many of the species were not known, and though some of the species have been placed in both sections of the key, it was probably not realized that the leaves of young vigorous plants of many of the "glabrous" species, flowering for the first time, are more or less pubescent.\* In that work no clear reference is made to the *types*, some of which are no longer in existence or consist of ♂ branches or old fruiting heads, and it is not possible to tell what actual plants are described. In some cases it is now known that more than one species is cited under one name, *e.g.* in *L. decorum*, *L. concolor*, *L. salignum* and, as I suspect, several others. In other words, the specimens cited cannot be trusted infallibly as belonging to the species to which they are attributed, a fact which has resulted in the greatest confusion in attempts to identify specimens with the Flora Capensis.

The incompleteness of many of the descriptions is, of course, due to the fact that the authors, as indeed they have stated, often only had material lacking all the necessary characters and were, for the purposes of the Flora, attempting to make bricks without straw. Further, they had to form their opinions from dried specimens, a procedure which, though unavoidable in many cases, is almost invariably misleading in this genus. I make these remarks with the object of pointing out to those herbarium workers who attempt to determine specimens (generally incomplete) from existing descriptions, that they are in many cases attempting the impossible. A large percentage of specimens now in herbaria are imperfect and, particularly those of unknown origin, practically worthless. The majority of collectors do not realize the necessity of obtaining complete material in this genus, with the flowering ♂ and ♀, the fruiting head and the fruits.

The genus is an extremely complex one, and many of the accepted species consist of a number of different local forms (*e.g.* *L. adscendens* R. Br.). There are, of course, a great many species still unnamed, but I do not believe that any useful purpose can be served by describing them, except from ample and complete living specimens of *precise locality*.

\* The unbranched shoots of such plants often produce single ♂ inflorescences twice as large as those on old much-branched plants.

As regards the *types* of the old species, some probably cannot be recognised with certainty, but where they still exist, they cannot, I imagine, be ruthlessly dissected, without which it is sometimes impossible to make an exact comparison. Some of them only consist of inadequate figures. (See notes under *L. saxatile*). Where there is the slightest doubt and where there are not complete and unmistakeable types of known origin, or other good evidence to go upon, it would be best to disregard these old species entirely, re-describe and figure the plants fully and give them new names, as I have done, or *may* have done in the case of *L. riparium*. Such a course will have to be adopted sooner or later if we are to get away from the present deadlock. Surely there is no necessity to allow the encumbrance of past inadequate work in such genera by the old botanists, who could know practically nothing of that with which they were professing to deal, to hold up all serious study of the genus.

From the synonyms given in the Flora Capensis it would appear that many of the trivial names now in use are not admissible by the modern rules of priority in nomenclature,\* but to check these synonyms would involve a great deal of travel and expense, which the results would probably not repay, besides requiring a real field knowledge of all the species concerned. In some cases different names were applied to each sex, and it seems inconceivable that Thunberg could not, in the course of his travels in South Africa, perceive that *Leucadendron* was a dioecious genus.

Apart from the nomenclature of the species, it is quite certain that the genus can never be systematically revised until some active and enthusiastic botanist is able to tour South Africa for a period of years, collect fully and observe in the field all the local variants and if possible accompany his descriptions with detailed drawings. Poring over incomplete herbarium specimens will not usefully advance our knowledge of the genus.

It must be remembered also that hybridisation is by no means uncommon.

***Leucadendron saxatile* Salter. (Proteaceae.)**

*L. decoro* affinis, sed ita differt:—*Frutex* ad 2·5 m. altus. *Folia* capitula cingentia ad anthesin lacticolora vel eburnea. ♂. *Capitulum* globosum vel depresso-globosum, receptaculo brevior et latior: gemmae apice interdum rubrae: bractae florales lineares, fere duplo longiores,

\* As an example, our common robust shrub, the Sugar Bush (*Protea mellifera* Th.) should apparently be known as *P. repens* Linn., the "Creeping Protea"!

infra omino pilosae : squamae hypogynae 3—4-plo longiores. ♀. *Stigma* integrum, non bifidum.

A stout shrub, 1—2·5 m. high, the branchlets villosopubescent. *Leaves* obtuse or subacute, rubromucronate, rarely red-margined towards the apex, obscurely pinnate-nerved, those of the stem green, oblong, oblong-ob lanceolate or the lower narrow-obovate, glabrous or the younger rather inconspicuously lanate-ciliate, the ♀ 4—8 cm. long, 2—3·4 cm. broad, the ♂ rather smaller : floral leaves cream-coloured in the flowering season, oblong or rarely lanceolate, acute or obtuse, the ♀ 5·5—9 cm. long, 1·5—4·2 cm. broad, the ♂ proportionately smaller, usually 4—5 cm. long. *Inflorescences* solitary, the brown basal bracts cano-ciliate, otherwise glabrous, the ♀ 1·1—1·8 cm. long, the ♂ smaller, the innermost longer and narrower than the outer. *Male heads* globose or depressed-globose, 1·5—2 cm. in diam. : receptacle  $1\frac{1}{2}$ — $2\frac{1}{2}$  times as long as its diam., often with a few barren bracts at the apex : floral bracts linear or slightly spatulate, obtuse, 3·5—4 mm. long, glabrous above, densely pilose with long silky white hairs beneath, ciliate towards the apex : flower bud 6—8 mm. long on opening, yellow, the younger sometimes tinged with red at the apex : perianth segments scarcely shorter than the tube, the limb 1·5—2 mm. long : anthers 1·4—1·8 mm. long : hypogynous scales yellow, 3·5 mm. long : pollen-presenter\* oblanceolate in outline, 1—1·3 mm. long. *Female heads* narrow-ovoid, 3—4 cm. long, 1·5—2 cm. in diam., the receptacle oblong, tapering upwards, about 4 times as long as its diam. : floral bracts about 5 mm. long, 8 mm. broad, lightly retuse at the apex, ciliate, with a tuft of silky hairs near the middle : perianth about 8 mm. long, the segments free. *Ovary* ovoid, 1 mm. long : hypogynous scales 1·5 mm. long : style clavate, glabrous : stigma entire, on the obliquely truncate upper anterior part of the head, 0·5 mm. broad. *Fruiting head* ovoid, 4—5 cm. long, glabrous : fruit compressed, obcordate or cuneate-obcordate, blackish, emarginate, winged, 6·5—8·5 mm. long, 5·5—6 mm. broad, tubercled (Fig. 1).

Cape Province : Cape Peninsula ; Nursery Buttress, 2,500 ft., *Esterhuysen* 8002 (type in Bolus Herbarium), Nursery Gorge, 2,300 ft., *Esterhuysen* 8001, *L. Bolus* (B. Herb. 15681), *Compton* 11194 ; Wood Buttress, *Esterhuysen* 8000 (1,500 ft.), 8003 (2,000 ft.) ; Kasteel Poort, *L. Kensit* (B. Herb. 10746) ; Table Mt., *Marloth* (B. Herb. 7233), *Phillips* (S. Af. Mus. 4546), *Esterhuysen* 8215, *Pillans* 7267 ; Lion's Head, *Pillans* 8546-7 ; Kalk Bay Mt., *Levy's* 7571, *Adamson* 3387, *Salter* 312/17

\* The descriptions of the so-called *stigma* in the ♂ flower given in the *Flora Capensis* refer to the specialised terminal portion of the style which holds the pollen and acts as a pollen-presenter when the flower opens. The stigma, of course, is confined to the ♀.



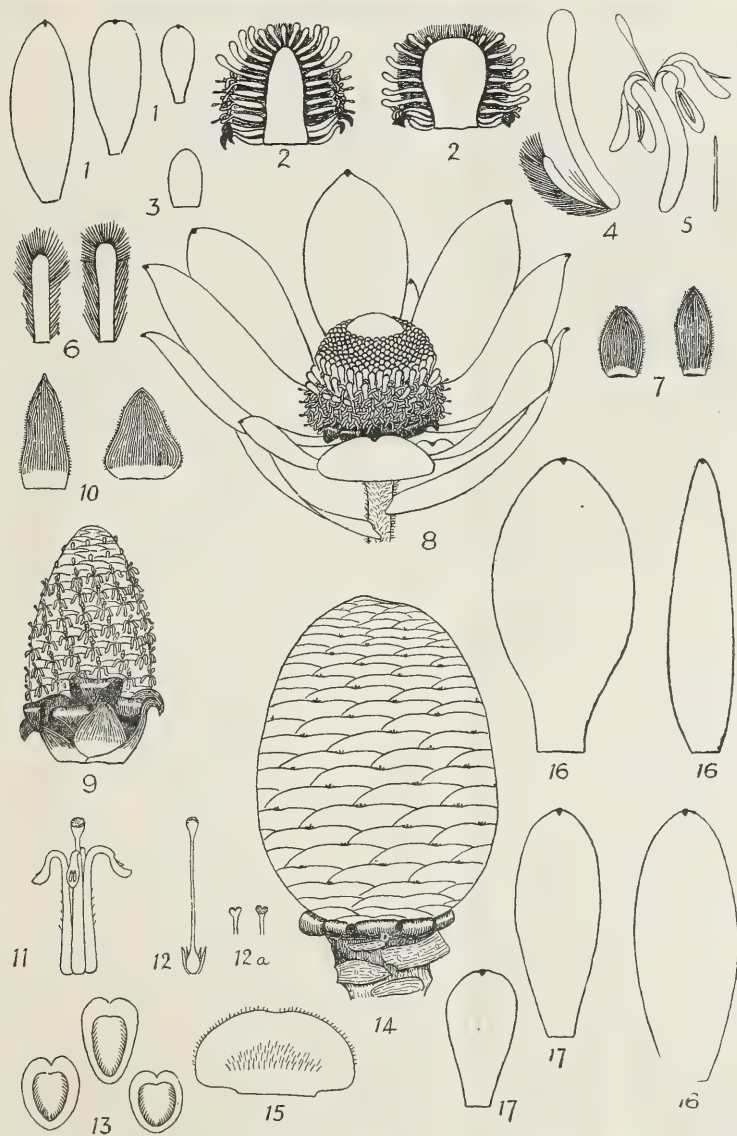


FIG. 1. *Leucadendron saxatile* Salter. Natural size, except where otherwise indicated. MALE. 1. Stem leaves  $\times \frac{1}{2}$ . 2. Flowering head, in section. 3. Receptacle of a small flowering head. 4. Flower bud and bract  $\times 4$ . 5. Perianth, pollen-presenter and hypogynous scale  $\times 4$ . 6. Floral bracts, upper face  $\times 4$ . 7. Basal bracts. 8. Inflorescence. FEMALE. 9. Flowering head. 10. Basal bracts. 11. Perianth and style, anterior view  $\times 3$ . 12. Style and stigma. 12a. Stigma in *L. decorum* R.  $\times 3$ . 13. Fruits  $\times 1\frac{1}{2}$ . 14. Fruiting head. 15. Floral bract  $\times 3$ . 16. Flowering leaves  $\times \frac{1}{2}$ . 17. Stem leaves  $\times \frac{1}{2}$ . (Esterhuysen 8002). Del. T.M.S.

(♂ in Brit. Mus.) ; Kommetje (probably an error in locality), Galpin 4447. Fl. Aug.—Sep.

The following, not seen, are probably this species (see notes below):—Kasteel Berg, Wolley-Dod 1786 ; Table Mt., Bolus 2910.

This shrub, which usually grows in rocky places, is, as far as is yet known, confined to the mountains of the Cape Peninsula, being fairly plentiful on Table Mountain from 1,500 ft. to near the summit, but rare and very local near the tops of Constantiaberg and Kalk Bay Mt., and it has been recorded from the upper south-west slopes of Lion's Head.

It is most nearly related to *L. decorum* R. Br., but a less compact taller shrub in which the floral leaves of both sexes are cream or sometimes ivory-coloured in the flowering season. The ♂ inflorescence is globose or depressed-globose, the receptacle, though very variable in shape, being always shorter in proportion to its diam., and the flower buds are in some cases, though not always, red-tipped. The linear obtuse ♂ floral bracts are nearly twice as long and pilose on the whole of the lower surface, and the hypogynous scales 3 to 4 times as long. In the ♀ the stigma is entire, not bifid as in *L. decorum*. It is highly prone to epharmonic variation, the inflorescences and floral leaves of plants from exposed slopes high on Table Mt. being less than half the size of those from more sheltered positions.

It is probably the species which was mistaken for *L. grandiflorum* R. Br. by Bolus and Wolley-Dod (Flowering Plants and Ferns of the Cape Peninsula, in Trans. S. Af. Phil. Soc. XIV. (1903), p. 313), who may have been misled by the figure in Bot. Mag. (1814) t. 1650, *L. grandiflorum* Sims, non R. Br. (♂ only). This figure represents some species of unknown origin, which does not appear to have been hitherto identified, and it may be intended for the male of our plant. Although the leaves are much more densely ciliate, this is to be expected in a young cultivated plant probably flowering for the first time, but I cannot account for the exaggerated red margins of the leaves. This old imperfect figure, however, is of no scientific value.

Ever since the publication of the Flora Capensis, Vol. V, i (1912) *L. saxatile* has been erroneously known as *L. concolor* R. Br. The description of *L. concolor* in the Flora Capensis seems to apply to the ♂ of *L. saxatile* (described here) and to the ♀ fruiting head of Zeyher 3638, two very different species, and the specimens cited for the ♂ cannot by any means be attributed to *L. concolor*. There seems, however, to be considerable doubt as regards the true identity of that plant. The trivial name *concolor* was first applied by Knight in Knight's Proteaceae (1809) 24, under *Euryspermum concolor*, and both Knight and R. Brown, who transferred it to *Leucadendron*, cite the figures of the earlier *Protea*

*globosa* in Andr. Bot. Rep. t. 307 (July 1803) and Bot. Mag. (1805) t. 878, both drawn from cultivated ♂ inflorescences, probably grown from fruits collected for Lee and Kennedy by Niven near Palmiet River in Caledon Division. Unless any wild specimens of this collecting are still in existence (which is extremely doubtful), Andrews' figure in Bot. Rep. would appear to represent the *type* and if, for reasons given later, the species is worth considering at all, its trivial name should probably be *globosum*. Both figures show a species with floral leaves the same colour as those on the stem (hence the name *concolor*), a large flat-topped inflorescence (hemispherical according to Knight) and a zygomorphic perianth, a class of *Leucadendron* which never has flat winged fruits. It is utterly unlike *L. saxatile*, which has the most striking pale cream-coloured floral leaves, a globose ♂ inflorescence, an actinomorphic perianth and flat winged fruits. It seems highly probable, judging from the evidence of the two quite inadequate figures and its source of origin, viz. Palmiet River, that it is one of the many forms of the polymorphous *L. ovale* R. Br., but, like many of the early imperfectly described species of *Leucadendron*, unless adequate specimens of the type, both ♂ and ♀, can be found, it would be best relegated to "species ignotae."

Of the specimens cited in Flor. Capensis under *L. concolor*, Galpin 4447, ♂ only, Kommetje, which is in the Nat. Herb. at Pretoria, is the species here described as *L. saxatile*, but in my opinion and that of others who have studied the distribution of the Proteaceae in the Cape Peninsula, the locality given is almost certainly false, and Galpin's specimen probably came from Table Mt. Unfortunately neither *Wolley-Dod* 1786, Kasteel Berg, nor *Bolus* 2910, Table Mt., appear to be represented in any South African herbarium, but presumably they are the same as *Galpin* 4447 and, since the authors stated that they had not seen the flowering ♀, both must be males. As there is no other species on Table Mt. which could possibly answer the description and, as this plant is plentiful about Kasteel Berg, it may, I think, be assumed that both these specimens are *L. saxatile*. *Masson*, without locality, has not been seen, but it is not the *type*.

The ♀, *Zeyher*, from Van Stadens Berg (Uitenhage), of which there is a poor fruiting specimen in the South African Museum at Cape Town, might possibly be the *L. concolor* of Knight's Proteaceae and R. Brown, though apparently the only evidence to connect it with Knight's description is that the bases of the scales of the fruiting heads are tomentose. On the other hand, since modern observation has shown that nearly all species of *Leucadendron* are comparatively local in their distribution, it is improbable that it is the same as any species occurring near Palmiet River.

*L. decorum*, R. Br., to which I have referred as the nearest affinity of this and the following species, is understood in South Africa to be the sturdy broad-leaved early-flowering species (June—July) exemplified by the specimen *Bolus* 3737 from Wynberg Hill and common in the Cape Peninsula and Caledon Div. Meisner, in D.C. XIV, states that the *type*, in Herb. Banks, was collected by Masson "in Planitie Capensi," though R. Brown, the original author, does not mention the name of the collector. Brown cites *Protea laureola* Lam. as a synonym, but since he had no suspicion that there were several rather similar species, it would, I consider, be dangerous to assume that it is the same, without further scrutiny of the specimens and possibly dissection of the ♂ inflorescence. For this reason I have disregarded the recently made new combination *L. laureolum* (Lam.) Fourcade,\* which is based upon literature. Though the description in the Flora Capensis certainly seems to apply to the ♂ of our supposed *L. decorum*, that of the ♀ is apparently taken from some other species. The floral bracts are transversely oblong, much wider than long, *not* ovate, the mature fruiting head glabrous, *not* rusty pubescent and the fruits, the largest samaras I have seen in the genus are 5—7 lines long and at least 5 lines broad, *i.e.* more than twice the size of those described. The synonym *Euryspermum grandiflorum* Salisb., cited with a question mark, is the acknowledged *type* of *L. grandiflorum* (Salisb.) R. Br. The specimen *Zeyher* 3635 partly,† Grietjes Pass (Gat ?) in Herb. Brit. Mus. is, according to Mr. S. Garside, *L. Stokoei*.

I am much indebted to Miss E. Esterhuysen and Professor R. L. Adamson for collecting the excellent fresh material from Table Mt. and Kalk Bay Mt., from which the description and figure of *L. saxatile* have been compiled.

#### **Leucadendron Guthrieae** Salter. (Proteaceae.)

*L. decoro* affinis, sed ita differt :- ♂. *Capitula* globosiora, minora. *Bractae* florales duplo longiores, apice acutae, infra in parte superiore glabrae, in capitulis junioribus non gemmas superiores occultantes. ♀. *Bractae* florales paene glabrae, non ciliatae, apice subacutae. *Stigma* integrum, nec emarginatum nec bilobatum.

A compact shrub, up to 2 m. high, the branchlets villosopubescent or more rarely glabrous. *Leaves* obtuse or subacute, rubro-mucronate, rarely red-margined towards the apex, those of the stem green, oblong, oblong-oblancoelate or the lower narrow-obovate, glabrous, sometimes

\* Bot. Survey of S. A., Memoir 20: Check List (1940), 63.

† The other part is cited under *L. squarrosus* R. Br.



villous at the base, or in young plants, like the floral leaves, inconspicuously lanate-ciliate, the ♀ 5—10 cm. long, 1.6—2.4 cm. broad, the ♂ rather smaller: floral leaves yellow in the flowering season, oblong, the ♀ 3.5—11 cm. long, 1—3 cm. broad, the ♂ rather smaller. *Inflorescences* solitary, the brown basal bracts entirely glabrous, 6—9 mm. long in the ♀, but slightly longer in the ♂, the innermost longest. *Male heads* subglobose, the apical bracts not barren and the buds all visible: receptacle oblanceolate in outline, about 3 times as long as its diam.: floral bracts lanceolate, acute, about 4 mm. long, glabrous above, densely pilose with white silky hairs on the lower part beneath, the tips entirely glabrous: flower bud about 7 mm. long on opening: perianth yellow, the segments as long as the tube, the limb 2 mm. long: anthers 1.5 mm. long: hypogynous scales very slender, 3 mm. long: pollen-presenter oblanceolate in outline, 1.4 mm. long. *Female heads* narrowly ovoid-ellipsoid, 2—3 cm. long, 1.3—1.6 cm. in diam., the receptacle oblong, subacute, nearly 6 times as long as its diam.: bracts about 5 mm. long, 8 mm. broad, inconspicuously subacute at the apex, with a minute tuft of silky hairs near the middle, eciliate: perianth 7 mm. long, the segments free. *Ovary* ovoid, slightly compressed, about 1.6 mm. long, rather longer than the hypogynous scales: style clavate, 5.5 mm. long, the stigma entire on the obliquely truncate upper anterior face of the head, 0.5 mm. broad. *Fruiting head* ovoid, 4.5—6 cm. long, glabrous, brownish: fruit compressed, black, suborbicular, emarginate at the apex, broadly winged, about 1—1.2 cm. in diam., slightly pitted (Fig. 2).

Cape Province: Caledon Div.; Shaw's Mountain, *L. Guthrie* (Bol. Herb. 26663, type in Bolus Herbarium) 120, *Garside* 4749, 4833; Steenbras River, *Stokoe* (B.H. 17459); Kogelberg, *Stokoe* 8066, 8067; near Elgin, *Gillett* 4360; Sugarloaf, *Esterhuysen* 5086; Hermanus, *L. Guthrie* (B.H. 17459, 17591, 26664); Hangklip, *Compton* 13530: Bredasdorp Div.; Elands Kloof Mts., 5 miles S.W. of Papies Vlei, *Garside* 4695, *Salter* 4856 (at Kew and Brit. Mus. as *L. concolor*). Fl. Aug.—Sep.

This species has also been confused with *L. concolor* R. Br. owing to its superficial similarity, when dried, to *L. saxatile* Salter (q.v.), but it seems to be most closely related to *L. decorum* R. Br., from which it may be distinguished by its more globose inflorescences and the floral bracts. Those of the ♂ are about twice as long, having acute glabrous tips, which do not conceal the buds in the upper part of the young inflorescence as in *L. decorum* and *L. saxatile*. Those of the ♀ are almost glabrous and eciliate, while the stigma is entire, not bilobed or emarginate.

It gives me great pleasure to name this species in honour of Miss L. Guthrie, whose collecting, Bol. Herb. 17591 from Hermanus, is the earliest which I have been able to trace. Amongst her collection of water-colour

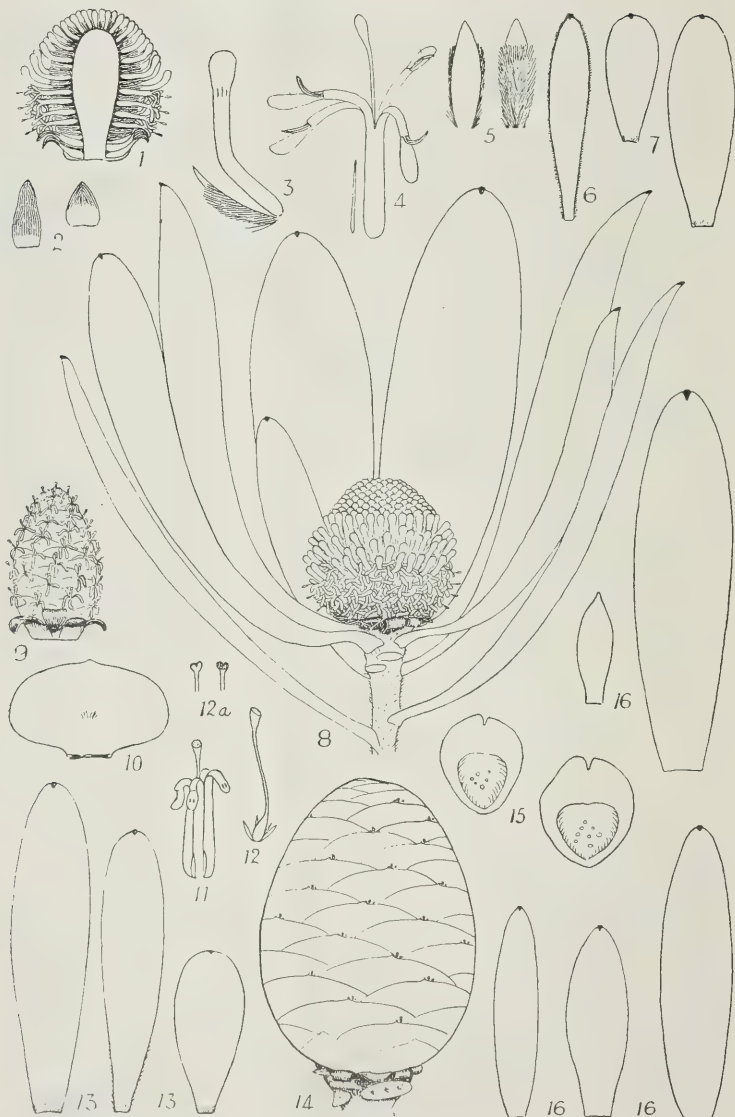


FIG. 2. *Leucadendron Guthrieae* Salter. Natural size, except where otherwise indicated. MALE. 1. Flowering head, in section. 2. Inner and outer basal bracts. 3. Flower bud and bract  $\times 4$ . 4. Perianth and hypogynous scale  $\times 4$ . 5. Floral bract, upper and lower face  $\times 4$ . 6. Stem leaf of a young plant  $\times \frac{1}{2}$ . 7. Stem leaves of a mature plant  $\times \frac{1}{2}$ . 8. Inflorescence. FEMALE. 9. Flowering head. 10. Floral bract  $\times 3$ . 11. Perianth and style, anterior view  $\times 3$ . 12. Style and stigma, side view, with hypogynous scales  $\times 3$ . 12a. Stigma in *L. decorum* R. Br.  $\times 3$ . 13. Stem leaves  $\times \frac{1}{2}$ . 14. Fruiting head. 15. Fruits  $\times 1\frac{1}{2}$ . 16. Floral leaves  $\times \frac{1}{2}$ . (*L. Guthrie* in B.H. 26663.) Del. T.M.S.

paintings of the Proteaceae,\* this plant was illustrated in 1933 as unidentified, and she has lately been good enough to send me a copious supply of living specimens from two localities, from which my description and figure have been compiled, besides furnishing me with valuable notes on some of the other species.

***Leucadendron sabulosum* Salter. (Proteaceae.)**

*L. saligno* affinis, sed ita differt :- *Frutex* robustior, ad 4 m. altus, in partibus omnibus major. *Folia* latiora, adulta glabra, floralia longiora exteriora ad basin semitorta. ♀. *Stigma* emarginatum, non bilobatum. ♂. *Bracteae* multae florales superiores steriles, quamobrem capitulum maturum apicem versus calvum. *Stylus* mas paulo infra apicem constrictus, apice truncatus, non bifidus.

A stout shrub, 1.5—4 m. high, the ascending branchlets erect, adpressed-pubescent. *Leaves*, when mature, glabrous, those of the stem erecto-patent, oblong-ob lanceolate, rubro-apiculate, including the uppermost half-twisted near the base and in profile position, the ♀ 3—6 cm. long, 6—9 mm. broad, the ♂ proportionately smaller, the upper turning yellow in the flowering season: floral leaves about 6, broader at the base, yellow (the ♀ paler), not half-twisted, usually 1.5—2 cm. long, often with 1—2 longer and intermediate with the stem leaves. *Inflorescences* solitary, the basal bracts brown, ciliate, 6—8 mm. long, the innermost longest. *Male heads* subglobose, or at length ovoid, 1—2.1 cm. long, dome-shaped and barren towards the apex, the receptacle oblong-lanceolate in outline,  $3\frac{1}{2}$  times as long as its diam.: floral bracts convex, obovate, attenuate to the base, about 2 mm. long, glabrous above, densely tufted with long silky white hairs on the upper half of the keel and about the anterior margin beneath: flower bud 5 mm. long at opening: perianth yellow, the segments rather longer than the tube, the limb about 2 mm. long: anthers 1.5 mm. long: hypogynous scales very slender, 1.5—2 mm. long: style 4.5—5 mm. long, the pollen-presenter about 1.2 mm. long, ob lanceolate in outline, with a constriction below the truncate apex. *Female heads* ovoid-ellipsoid, 2—2.2 cm. long, 1.2 cm. in diam., the receptacle 6 times as long as its diam.: floral bracts transversely oblong, the lower about 3.5 mm. long, 9 mm. broad,

\* Miss Guthrie, who has inherited her love of botany from her father, Professor F. Guthrie, who collaborated with Dr. H. Bolus in the account of the genus *Erica* in the *Flora Capensis*, has been making a special study of the South African Proteaceae from living plants since 1930, and has already made 284 exquisite accurate water-colour paintings, with line dissections, of by far the greater number of the known species in this family, including many natural hybrids. Like all botanists, she has found, for the reasons already stated, the greatest difficulty in identifying the species of *Leucadendron*. It is to be hoped that her work will eventually be published, for it will be an invaluable contribution to botany.

sometimes very slightly retuse at the apex, densely and shortly silky-pubescent except near the base: perianth 4—5 mm. long, the segments free, the posterior and anterior flat, the latter scarcely widened and retuse at the apex, shorter than the others and almost concealed by the bract, the lateral pair conduplicate with the boat-shaped limb only visible. *Ovary* flattened, about 1.1 mm. long, slightly retuse at the apex: hypogynous scales orange-yellow, shorter and broader than in the ♂: style rather longer than the perianth, broadening in the upper half with a flattened capitate head about 0.8 mm. broad, the emarginate stigma oblique on its anterior face. *Fruiting head* ovoid, truncate, about 3 cm. long, 2.5 cm. in diam., the bracts glabrous on the upper half, tomentose below: fruits blackish, widely ovate or obovate, compressed, broadly winged, deeply emarginate at the apex, 6—9 mm. long, 5—8 mm. broad, slightly pitted (Fig. 3).

Cape Province: Cape Peninsula; sandy flat on north side of east end of Slangkop Ridge, *Pillans* 9787 (type in Bolus Herbarium); Fish Hoek, *Pillans* 6785, *Page* (B. Herb. 16328); Llandudno, *Levy's* 6823; Hout Bay, *Compton* 9166, *Acock* 5844; Karbonkelberg, *Salter* 7742, *Compton* 5977; Red Hill, *Pillans* 7052, *Garabedian* (S.A. Mus. 52198—200); Smith's Farm, *Salter* 6217; Buffel's Bay, *L. Bolus* (B. Herb. 16001); Caledon Div.; Hermanus, *L. Guthrie* 111; Hangklip, *Pillans* 8211, *Compton* 13570; Bredasdorp Div.; 4 miles north of Struys Bay, *Salter* 4817 (pars foliis glabris), *Garside* 4679 (pars foliis glabris). Fl. Aug.—Sep.

*L. sabulosum* is a common species, occurring from the Cape Peninsula as far east as Bredasdorp Division, nearly always in sand, usually not far from the sea and often in large dominant colonies.

It is an affinity of *L. salignum* R. Br., with which it appears to have been formerly confused, but it is a much more robust species, larger in all parts, with thicker glabrous leaves and with the peculiarity (which it shares with *L. eucalyptifolium* Buek ex Meisn.), of having all, except the few short wide-based bract-like leaves surrounding the inflorescence, half-twisted at the base into profile position. It is also distinguished from *L. salignum* by the large emarginate, not bilobed stigma, by the constriction below the truncate apex of the pollen-presenter and the more pronounced dome at the top of the ♂ inflorescence, left by the numerous barren upper floral bracts, even at maturity. *L. eucalyptifolium*, an eastern woodland species, never occurring in sand, differs in having much longer more shortly apiculate leaves, ♂ flower buds square in section, hooded or incurved ♂ perianth limbs and smaller ♀ flower heads and fruits.

A close affinity to *L. sabulosum*, either a marked variety or a separate



species, occurs in several localities in Bredasdorp Div. and actually grows in association with it about 4 miles north of Struys Bay. It differs as follows :—Leaves rather shorter, more obtuse at the apex, silvery-grey

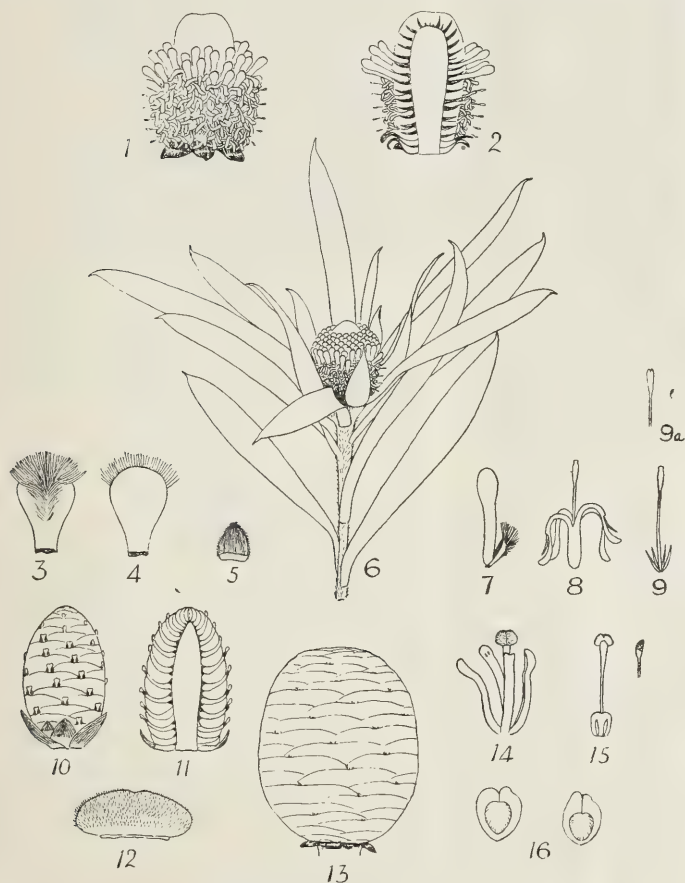


FIG. 3. *Leucadendron sabulosum* Salter. Natural size, except where otherwise indicated. MALE. 1. Flowering head  $\times 1\frac{1}{2}$ . 2. Ditto, in section  $\times 1\frac{1}{2}$ . 3. Floral bract, lower face  $\times 6$ . 4. Ditto, upper face  $\times 6$ . 5. Basal bract. 6. Inflorescence. 7. Flower bud and bract  $\times 3$ . 8. Perianth  $\times 3$ . 9. Style and pollen-presenter, with hypogynous scales  $\times 3$ . 9a. Pollen-presenter in *L. salignum* R. Br.  $\times 3$ . FEMALE. 10. Flowering head. 11. Ditto, in section. 12. Floral bract  $\times 2$ . 13. Fruiting head. 14. Perianth, anterior view  $\times 3$ . 15. Gynaecium, posterior view, with hypogynous scales and side view of stigma  $\times 3$ . 16. Fruits. (Pillans 9787.). Del. T.M.S.

or dull green, more or less silky-pubescent, especially in the grey-leaved form, the longer floral leaves not turning yellow in the flowering season, the shorter yellow, clasping the inflorescence closely. Male heads with very few barren bracts at the apex: bracts hairy on the whole of the lower surface: perianth and hypogynous scales smaller: pollen-presenter about 0.8 mm. long, *oblanceolate in outline, notched at the apex*. ♀. Bracts of the fruiting head tomentose on the upper half.

I have purposely refrained from naming this plant, since the above particulars have been taken partly from dried specimens and partly from information supplied to me by Miss L. Guthrie, who has made drawings of it. As already stated, I consider that the species in this genus can only be accurately described from ample living specimens. The range of variation between the dull green-leaved and grey forms also requires field observation.

Two or three plants were recently discovered by Miss L. Guthrie (Salter 8696 in Bol. Herb.) at Kogelfontein, in the south of the Cape Peninsula, which had the appearance of being hybrids with *L. uliginosum* R. Br., which was growing in association. Unfortunately the site on which they grew was cleared for farming before they could be examined in the flowering stage.

### ***Leucadendron riparium* Salter. (Proteaceae.)**

*Frutex* omnino glaber vel ramulis junioribus robustis sparse villosis folisque sparse ciliatis. *Folia* rubro-mucronata, ea ramulorum viridia, oblonga vel oblanceolata, ♀ 3—6 cm. longa, 6—8 mm. lata, ♂ paulum minora; floralia ad basin imbricata, ad anthesin eburnea vel lactea, oblonga vel plus minusve lanceolata, ♀ 3.5—7 cm. longa, 0.9—1.5 cm. lata, ♂ valde minora. *Capitulum* ♂ globosum, 1.1—1.6 cm. diam.: bractae florales 2 mm. longae, supra glabrae, infra in dimidio superiore pilosae: perianthium fere 6 mm. longum. *Capitulum* ♀ ovoideum, 1.6—2.1 cm. longum: bractae apice rotundatae, fere 9.5 mm. latae, glabrae, minute ciliatae: perianthium fere 6 mm. longum. *Ovarium* ovoideum, 1 mm. longum: stylus clavatus: stigma anteriore obliquum, 0.5 mm. latum. *Strobilus* ovalis, ad 2.7 cm. longus: samara suborbicularis, compressa, alata, fere 0.7 mm. diam.

Anerect shrub, scarcely 1 m. high, the ascending branchlets glabrous or very sparsely villose in vigorous young shoots. *Leaves* acute or subobtusely, rubro-mucronate, glabrous or sparsely ciliate when young, those of the stem green, oblong or oblanceolate, the ♀ 3—6 cm. long, 6—8 mm. broad, the ♂ rather smaller: floral leaves spreading, those of the ♀ ivory-coloured in the flowering season, more or less lanceolate or oblong, 3.5—7 cm. long, 0.9—1.5 cm. broad, the ♂ pale yellow or

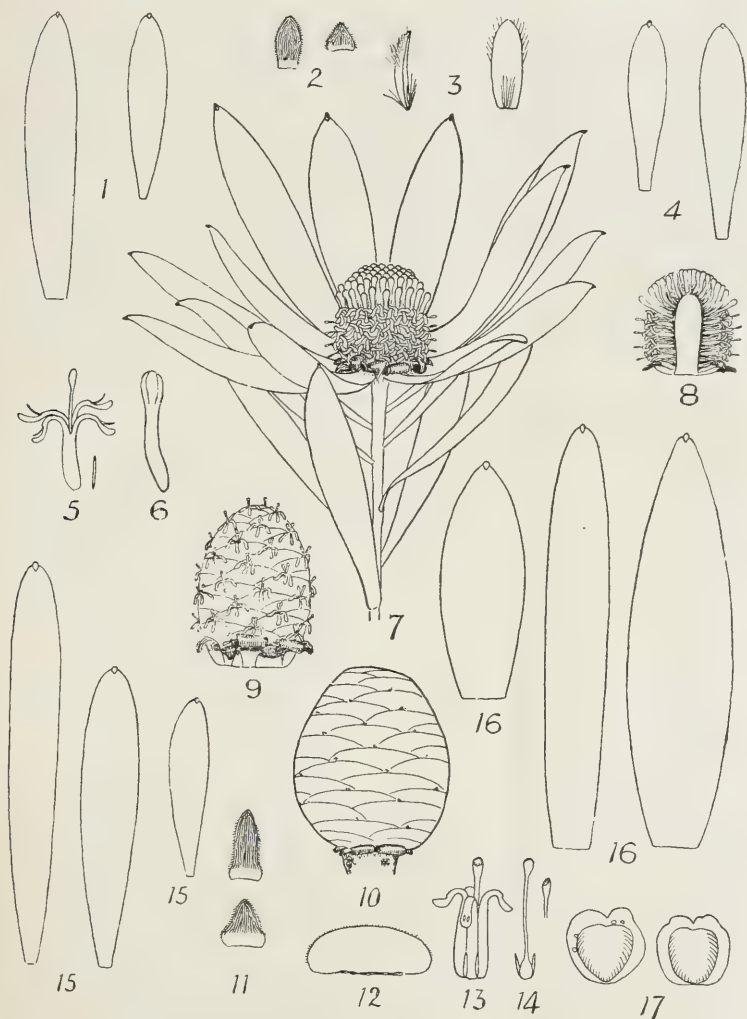


FIG. 4. *Leucadendron riparium* Salter. Natural size, except where otherwise indicated. MALE. 1. Stem leaves. 2. Basal bracts of flowering head. 3. Floral bract, side view and upper face  $\times 6$ . 4. Floral leaves. 5. Perianth and pollen-presenter with hypogynous scale  $\times 3$ . 6. Flower bud  $\times 3$ . 7. Inflorescence. 8. Flowering head, in section. FEMALE. 9. Flowering head  $\times 1\frac{1}{2}$ . 10. Fruiting head. 11. Inner and outer basal bracts. 12. Floral bract  $\times 2$ . 13. Perianth and style, anterior view  $\times 3$ . 14. Gynaecium and hypogynous scales, posterior view  $\times 3$ . 15. Stem leaves. 16. Floral leaves. 17. Fruits  $\times 1\frac{1}{2}$ . (Salter 8757.) Del. T.M.S.

cream-coloured, usually imbricating at the base, 2.5–3.3 cm. long, 6–8 mm. broad. *Inflorescences* solitary, the ♂ often numerous on short branchlets: brown basal bracts ciliate, otherwise glabrous, the innermost longest, the ♀ 7–10 mm. long, the ♂ rather smaller. *Male heads* globose, 1.1–1.6 cm. in diam., the receptacle oblong, obtuse, about  $3\frac{1}{2}$  times as long as its diam., the apical bracts not barren: floral bracts oblong, subacute, about 2 mm. long, glabrous above, except for a tuft of hairs at the base, pilose with long silky white hairs on the upper half of the lower face: flower bud yellow, about 6 mm. long on opening: perianth segments about as long as the tube, the limb about 1.4 mm. long: anthers 0.8–1 mm. long: hypogynous scales 1.7 mm. long: pollen-presenter oblanceolate in outline, entire, 1.2 mm. long. *Female heads* ovoid, 1.6–2.1 cm. long, 1.1–1.4 cm. in diam., the receptacle about 3 times as long as its diam.: floral bracts transversely oblong, rounded at the apex, about 3.5 mm. long, 9.5 mm. broad, glabrous, but minutely ciliate: perianth about 6 mm. long, the segments free. *Ovary* ovoid,\* 1 mm. long: hypogynous scales 1.6 mm. long: style clavate: stigma entire on the obliquely truncate upper anterior part of the head, 0.5 mm. broad. *Fruiting head* ovoid, truncate at the apex, up to about 2.7 cm. long and 2.3 cm. in diam., glabrous: fruit compressed, suborbicular, winged, emarginate, black, about 0.7 mm. in diam., obscurely pitted and tubercled. (Fig. 4. *The arrangement of the floral leaves in the ♀ is very similar to that shown in Fig. 5 (i), var. Pillansii.*)

Cape Province: Cape Peninsula; on the border of a marsh on the roadside near Modderdam, west of Klaasjagers Berg, *Salter* 8757 (*type* in Bolus Herbarium); on the banks of Elsies River, near the source, N.W. of Grootkop, *Pillans* 1989, *Salter* 6263. Fl. Aug.—Sep.

Var.  $\beta$  *collinum* Salter. ♀ *Bracteae* florales apice obscure acutae. ♂. *Folia* floralia pauca, valde angustiora, basin versus non imbricata. *Capitula* plerumque minora, saepe depresso-globosa.

Differs from the typical form as follows: ♀. Floral bracts obscurely acute at the apex. ♂. Floral leaves fewer, much narrower, and not imbricating at the base. Flower heads usually smaller, often depressed-globose.

Cape Province: Cape Peninsula; Nursery Buttress slopes, *Esterhuysen* 185 (*type* in Herb. Nat. Bot. Gardens, Kirstenbosch); Contour Path above Kirstenbosch, *Compton* 12011; Devil's Peak, *Compton* 13407, 13408; Noordhoek Mt., *Pillans* 9789, *Walgate* (B.H. 22666): Stellenbosch Div.; *Duthie* 666, 667; Banhoek, *Martley* (B.H. 22668); Jonker's Hoek, *Pillans* 7026: Paarl Div.; Du Toit's Kloof, *Pillans* 8456; Haal Kop, *Stokoe*

\* The ovary must be judged from its state in the newly opened flower, not from a partially-developed fruiting head.



(B.H. 18424): Caledon Div.; French Hoek Pass, *Pillans* 6848, *Salter* 4169; Steenbras, *Middlemost* (B.H. 22667). Fl. Aug.—Sep.

Var.  $\gamma$  **Pillansii** Salter. *Ovarium* compressum, subquadrangulatum, fere 0.8 mm. longum, 0.6—0.7 mm. latum, apice leviter emarginatum. *Samara* latissime cuneato-obcordata, basin versus vix alata, margine anteriore late alata, apice latissime incisa. ♀ *Bractae* florales apice obscure acutae.

Differs from the foregoing variety in having a compressed subquadrate ovary, about 0.8 mm. long, 0.6—0.7 mm. broad, slightly emarginate at the apex, and very broadly cuneate-obcordate fruits, scarcely winged towards the base, broadly winged on the upper margin, with a wide apical incision. The ♀ floral bracts are also obscurely acute at the apex (Fig. 5).

Cape Province: Cape Peninsula; marshy ground and slopes near stream at south base of Twelve Apostles, near Hout Bay Stream, *Pillans* 9786 (*type* in Bolus Herb.). Fl. Aug.—Sep.

This species is one of the many varying glabrous or almost glabrous plants with very pale cream or ivory coloured floral leaves (the ♀ much larger than the ♂), which have hitherto been placed in herbaria under *L. glabrum* R. Br. It seems to have been first discovered in the Cape Peninsula, where it is by no means common, by Mr. N. S. Pillans in 1912, and has, as yet, only been seen in a few places in the southern areas on the banks of streams and on the borders of one marsh.

The descriptions of *L. glabrum* are so scanty and conflicting that one is quite unable to apply them with certainty to any particular plant. R. Brown's original description is, of course, useless without reference to the *type* (*Wm. Roxburgh*, with the vague locality "prope Prom. B. Spei") which, according to Meisner, is or was in Herb. Banks. Meisner, in D.C. XIV, 220, also cites *Zeyher* 3642 from Klein River Mts. and his description, though longer, is still hopelessly inadequate. Of the ♀ he apparently only had the fruiting head, since he describes the ♀ capitulum as "as large as a walnut, about 1 inch in diam." If this is so, how can the species be recognised with any certainty?

In the Flora Capensis there is no reference to Roxburgh's *type*, and presumably the description applies to *Zeyher* 3642, the only specimen cited. Here the leaves are said to be 3—4 lines broad, whereas Meisner says 3—5 lines, *the floral half again or twice that width*. The specimens of *Zeyher* 3642 in the Nat. Herb. at Pretoria are superficially like *L. riparium*, except that the brown basal bracts of the ♀ inflorescence reach almost to its apex. The ovary is described, without size, as "oblong, produced at each side into a short point." I cannot check this, but if so, it is entirely different from the ovoid ovary of *L. riparium*.

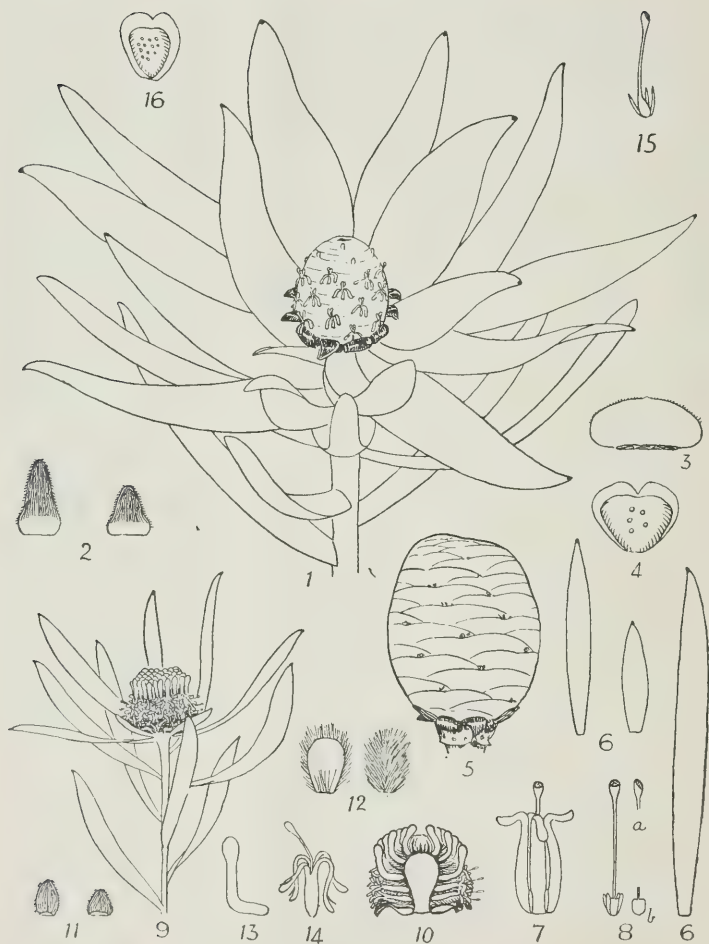


FIG. 5. *Leucadendron riparium* Salter, var. *Pillansii*. Natural size, except where otherwise indicated. FEMALE. 1. Inflorescence. 2. Inner and outer basal bracts. 3. Floral bract  $\times 2$ . 4. Fruit  $\times 1\frac{1}{2}$ . 5. Fruiting head. 6. Stem leaves. 7. Perianth and style, anterior view  $\times 3$ . 8. Gynaecium, anterior view, with hypogynous scales, (a) Stigma, side view, (b) Ovary  $\times 3$ . MALE. 9. Inflorescence. 10. Flowering head, in section  $\times 1\frac{1}{2}$ . 11. Inner and outer basal bracts. 12. Floral bracts, upper and lower faces  $\times 6$ . 13. Flower bud  $\times 3$ . 14. Perianth and pollen-presenter  $\times 3$ . (*Pillans* 9786). Var. *collinum*. 15. Gynaecium, side view, with hypogynous scales  $\times 3$ . 16. Fruit  $\times 1\frac{1}{2}$ . (Compton 13407.) Del. T.M.S.

Although my plant might fall under Meisner's scant description, I feel, with all this confusion, justified in describing it fully with a figure and naming it *L. riparium*. If Roxburgh's specimens are complete, and if they ever, after dissection, can be proved to be in exact agreement with my plant (mere superficial resemblance is not enough), then, at the cost of a synonym, we shall at least know what *L. glabrum* is and exactly where it can be found growing. I have only risked this synonym after long consideration: I am principally concerned in attempting to provide an intelligible account of the genus as it occurs in the Cape Peninsula.

Var. *collinum*, a hill-side form, possibly changed by habitat, only differs slightly. I have found a number of specimens of this variety in herbaria, nearly all without fruits, with the determination *L. minus* Phillips and Hutchinson, var. *glabrescens*, but I have not seen the *type* of that plant (*Burchell* 8006, Donker Hoek Mt.). *L. minus* appears to be quite a different species with densely villous branchlets, the constantly ciliate leaves being subequal in both sexes, the stigma terminal and the fruits (not described in *Flora Capensis*) smaller.

It is admittedly possible that intermediates may eventually be found between this variety and the typical form and also var. *Pillansii*.

In addition to those whose help I have already acknowledged, I am indebted to the Directors of the South African herbaria mentioned in this paper for facilities in examining specimens, to Mr. N. Pillans for living and dried material, and also to Mr. S. Garside for advice on certain technical points, and for information regarding some of the types of Proteaceae in Europe.